

*On an Apparatus designed for the Photographic Record of the Transit of Venus.*

By Signor J. Capello.

(*Extract from a letter to Dr. De La Rue. Translation.*)

I have just received your precious letter, with the sketch of the apparatus for M. Janssen's process. It is the only method of obtaining the exact instant of the contacts, free from personal errors, &c., in order to calculate the parallax by the methods of Halley or Delisle, and afterwards to make the comparison with the photographic methods properly so called, that is to say, the measurement of the series of photograms obtained after the first and before the last internal contacts. I have also received Mr. Abney's process: I was already acquainted with it from the *Photographic Year-book of 1874*, but I had not yet used it.

It is with the greatest regret that I have to announce to you that our expedition has failed. Our government, after having approved (May 1873) the plan and budget proposed by our Academy of Sciences: after having spent more than 350*l.* in preparations of all kinds, has recently (10 April 1874) abandoned the plan, for want of authority from the Chambers to pay the costs of the expedition: these costs do not exceed 2,000*l.*

We had made preparations and experiments for proceeding on the following plan. The difficulties were vanquished.

The dome or tower of the photoheliograph was itself a camera obscura: there was in a moveable shutter a hole always covered by the instantaneous apparatus: and another with a red glass, in order to point the photoheliograph by means of a lens at the side of the tube; this lens acting as a finder.

The instantaneous apparatus is quite independent of the photoheliograph; it is on an opaque shutter upon the moveable roof covering the hole A which allows the passage of the solar rays at the instant of the impression: this apparatus is composed of a cardboard disk, with a cut-out sector, figs. 1 and 2.

FIG 1.

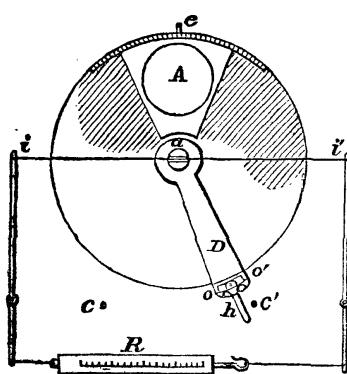
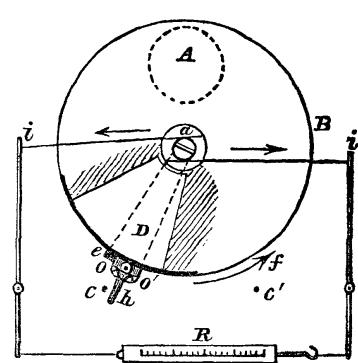


FIG. 2.



The axis (*a*) is pierced with a hole through which passes a thread *i i'*, which is kept stretched by the spring *R* by means of two vertical levers. In the figure 1 the apparatus is at rest; by making it assume the position of figure 2, moving in the direction *A B e* until the tooth *e* catches in the click *h*, it is drawn forcibly back by the spring, and tends to return in the contrary direction to a point near *c'*. Moving the arm *D* to which is fixed the click *h*, until it presses against the fixed point *c* the tooth *e* escapes, and after making a whole revolution the tooth *e* again catches, but on the side *o'*. Making the pointer move subsequently from *c* towards *c'*, and after having touched *h* at *c'*, the disk describes another revolution, but in the contrary direction, and so on alternately (from left to right and from right to left).

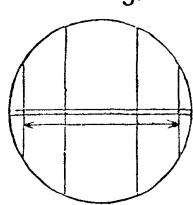
To each revolution corresponds an exposure. The duration of the exposure can be regulated, to within some thousandths of a second, to 0·4 or 0·5 of a second, according to the tension of the spring *R*.

The whole of this apparatus is the invention of one of the members chosen for the observations, M. Campos Rodrigues, of the Astronomical Observatory.

The dome of the photoheliograph being dark, the dry plates can be handled perfectly without the aid of the plate-holder (slide) : the plates resting on three silver points by means of a simple system of supports, also contrived by M. Campos Rodrigues. By this method one can, without difficulty, expose three plates in every two minutes, or even more rapidly.

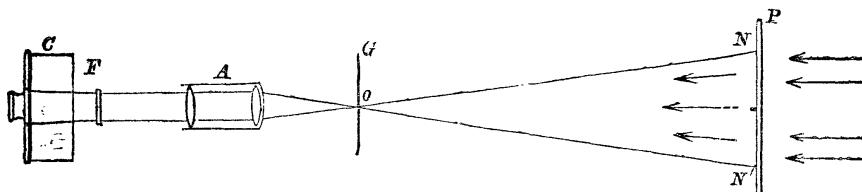
The dry collodion we had fixed upon was that chosen by the German Commission, and made by Dr. Fogel of Berlin. The process is Fothergill's albumen-process, with slight modifications ; it has given me very good images of the Sun; and according to Vogel's experiments, verified by myself, it contracts very slightly.

FIG. 3.



We have had spider threads on a very exact micrometer placed in the focal plane of the object-glass : the two horizontal ones being in the direction of the celestial equator, and the others perpendicular to it. The distance between the exterior ones carefully measured by the times of star transits would be our unity for measurement of the photographs.

The distortion always met with in the secondary magnifiers would be quite eliminated by the method of measuring the images of the photographs, due to M. Campos Rodrigues. The principle is quite astronomical.



In the measurements we employ the same magnifier *A*, and in the same relative position which it had in respect to the plate *P* on the occasion of the impression.

Making the luminous rays describe a path exactly opposite to that which they had in producing the picture, it is evident that the rays which have traversed the plate, proceed within the cone *ONN'* (the others are cut off by the diaphragm *G* at the optical point *o*), and traverse the lenses of the magnifier through the same points of the lenses which they had traversed in their path through the plate ; and, consequently, in this second passage are modified equally, but in the contrary sense, so that the new image at *F* is exactly equal to the focal image of the object-glass, the effects of distortion thus disappearing. Placing a micrometer at *C*, we can make the measures as in the direct observation of the Sun.

It is obvious that it is quite a different thing to measure the image of the Sun thus diminished by the magnifier, or to measure a photographic image produced by the object-glass ; in this second case all the imperfections are augmented ; one magnifies the granulation of the collodion, or of the silver, &c. ; which does not happen in the first case.

These are the principal points of the method we had decided upon, and which unfortunately, will not be realised ; it is just this which I regret, not to be able to realise a plan which in all probability would have succeeded.

If you approve of any of these points, for instance the method of measuring the photographs, it might be possible to employ them at some of the English stations.

*Lisbon,*  
1874, April 26.

Signor Capello, in a subsequent letter, enquires whether the personnel of the different English expeditions is quite filled up ; and, in the contrary case, whether it would be possible for him to join in any one of them ; by preference in the Northern hemisphere, so as not to take him too long a time from the Observatory. He has practised magnetic observations for sixteen years.

*On the Lunar Semi-diameter derived from Occultations of Stars.*  
By E. Neison, Esq.

It has been shown from a reduction of the Greenwich observation for the years 1861-1870 that the semi-diameter given by occultations of stars at the dark limb was considerably less than Hansen's value. As a variation in the apparent semi-diameter arising from irradiation was found with instruments of different aperture, it became necessary to determine if a similar variation existed in